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W. Darrell Busby
Iowa State University

Maro Ibarburu
Iowa State University

John D. Lawrence
Iowa State University

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Does the Graders Accuracy Explain the Increase in Called Yield Grades 4's and 5's?

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Darrell Busby, SW area extension specialist;
Maro Ibarburu, research associate II, dept. of economics;
John Lawrence, director, Iowa Beef Center

Summary and Implications

Carcass data from more than 38 thousand cattle was used to compare the called and measured yield grade in two different periods: before and after the slaughter plant incorporated another grader in the line to improve grading accuracy. The study shows that the graders accuracy significantly increased. The higher accuracy effected all yield grades, but most notably resulted in more called yield grade 4 and 5 carcasses. This analysis may be a forecast of the impact of instrument grading that will be more accurate than previously called grades.

Introduction

There is a concern between some participants of the beef industry about the increasing number of carcass called yield grade 4 and yield grade 5. Hueth, Lawrence and Marcoul (2004) showed that the graders errors in the predictions of the yield grade shift the proportion of the called yield grade to the middle of the distribution. Therefore an increase in the accuracy of the graders would probably increase the percentage of called yield grades 4 and 5 as well as yield grades 1. Accuracy of yield and quality grade are expected to improve in the future as USDA approves and packers adopt instrument grading.

On 06/30/2003 the slaughter plant where these cattle are slaughtered made an effort to increase the graders accuracy. This effort consisted in incorporating a second grader on the line. From then on one grader calls the quality grade and the other calls the yield grade, in that way both graders have more time to call the attribute and focus on only one grade. For the rest of the paper we will call *Period 1* the period before 06/30/2003 and *Period 2* the period after 06/30/2003.

This paper shows the percentage of measured yield grades and USDA called yield grades for 2 times periods (before and after the second grader was included) and analyzes the change in the graders accuracy.

Materials and Methods

Individual animal data representing 38,856 cattle (28,146 steers and 10,710 heifers) fed in 12 Iowa feedlots[1] between 2000 and 2006 were analyzed for this project. The dataset reports feedlot performance variables for each animal and carcass traits among other things. Carcass measurements for fat thickness (FT), ribeye area (REA), and estimated kidney, pelvic, and heart (KPH) fat are taken by trained and experienced technicians that collect carcass data daily in the plant.

The measured yield grade was estimated using the following equation:

Predicted yield= 2.50 + 2.5*FT + 0.20*KPH+ 0.0038* HCW – 0.32* REA, where "HCW" is the hot carcass weight.

The predicted yield grade from the equation above is rounded to the next lower integer. For example; the yield grade 2 is for predicted yield between 2.0 and 2.99 (Hueth, Lawrence, and Marcoul, 2004).

The measured and called yield grade distribution was estimated for two different time periods (January 2000-June 2003 and July 2003 - June 2006) to see if they had changed over time. The graders' called yield grade was compared with the measured yield grade for each animal for the two different time periods. The results are expressed as the conditional distribution of the called yield grade for a given value of the measured yield grade.

Table 1: Evolution of the measured and called yield grade distributions

	Measured Distribution		Called Distribution	
	Period 1	Period 2	Period 1	Period 2
YG 1	7.37%	9.36%	7.26%	10.30%
YG 2	49.82%	53.69%	50.61%	49.78%
YG 3	40.22%	34.96%	40.64%	37.95%
YG 4	2.56%	1.94%	1.46%	1.89%
YG 5	0.03%	0.05%	0.03%	0.09%

[1] Data was provided by Tri-County Steer Carcass Futurity Program

Results

The cattle in the dataset have significantly fewer yield grade 4 and 5 cattle than the national average. Much of this lower level can be attributed to management and careful sorting at slaughter. Even though the percentage of measured YG 4 & 5 decreased from 2.59% to 1.99% between these 2 periods (Table 1), the percentage of called YG 4 & 5 increased from 1.49% to 1.98%. Moreover the percentage of measured YG 1 increased from 7.37% to 9.36% but the percentage of called YG 1 increased even more, from 7.26% to 10.30%. The decrease in the percentage called YG 3 compensates the others.

Table 2 shows that the accuracy of the graders increased in the second period with respect to the first one for all the yield grades, and most of the increase in the accuracy are in the extreme yield grades where they were less precise in the past. For example: in the *Period 1* they only predicted 58.2% of the YG 1 correctly but for the *Period 2* they predicted 86.9% of the YG 1 correctly. What motivates a packer or industry to invest in more accurate grading? Table 3 shows the expected value of the called YG premiums and the expected value of the measured yield grade premiums if no errors were made by the graders. One interesting thing to see is that the graders errors in the first period caused the packer to pay an average of $1.32/head more premiums that they would pay if the yield grade could be measured without errors. In the second period packers paid an average of $0.15/head less premiums that they would pay if the yield grade could be measured without errors. Both differences are different than zero with 95% confidence but this difference is close to zero for the *Period 2.*

Conclusions

The grader errors caused some yield grade 1's to be called 2 or 3 resulting in lower premiums for producers that send low yield grade cattle, while some yield grades 4's and 5's are called 3 resulting in higher premiums for producers that send high yield grade cattle. Therefore, grader errors reduce the incentives causing underinvestment for improving yield grade.

Hueth, Lawrence and Marcoul found that the errors tend to shift the proportions to the middle of the distribution. Therefore it is possible that the increase in accuracy is what is causing that more yield grade 4's and 5's to be called giving the idea that the called yield grade is increasing. However, it is not clear that other plants have adopted the two grader system or are using approved instrument grading to improve accuracy. The changes in this one plant are not enough to account for national trends. The $1.32/head higher premium that the slaughter plant was paying in the first period is probably a good motivation to incorporate the second grader to increase the accuracy. But there are still some errors and they not only cause some level of underinvestment but also creates some loss of confidence of producers in grading. Implementing instrument grading could not only improve accuracy but also reduce the subjectivity level of the measure helping to increase producers' confidence in the grading system.

Table 2: Probability that the called YG=i given that the measured Yield=j for both sexes in both periods ... Prob(YG=i | Yield=j)

Period 1 (before 06/30/2003)							Period 2 (after 06/30/2003)					
i* \ *j	Yield 1	Yield 2	Yield 3	Yield 4	Yield 5		***i* \ *j***	Yield 1	Yield 2	Yield 3	Yield 4	Yield 5
YG 1	**58.2%**	5.9%	0.1%	0.0%	0.0%		YG 1	**86.9%**	4.0%	0.0%	0.0%	0.0%
YG 2	41.0%	**76.8%**	23.2%	0.5%	0.0%		YG 2	12.7%	**86.3%**	6.5%	0.0%	0.0%
YG 3	0.8%	17.3%	**76.1%**	52.7%	0.0%		YG 3	0.4%	9.7%	**92.9%**	10.8%	0.0%
YG 4	0.0%	0.0%	0.6%	**46.4%**	42.9%		YG 4	0.0%	0.0%	0.5%	**87.1%**	11.1%
YG 5	0.0%	0.0%	0.0%	0.4%	**57.1%**		YG 5	0.0%	0.0%	0.0%	2.1%	**88.9%**

Note: The numbers in the diagonal of the table represent the percentage of observation predicted correctly for each yield grade.

Table 3: Measured and called yield grade premiums ($/head) for both periods

	Period 1 (before 06/30/2003)	Mean	St. Dev.	# obs
A	Measured Yield grade premium	9.943	20.834	21695
B	Called YG premium	11.265	17.944	21695
	Difference (*A-B*)	-1.322	15.563	21695
	Period 2 (after 06/30/2003)	Mean	St. Dev.	# obs
C	Measured Yield grade premium	12.324	20.262	17161
D	Called YG premium	12.173	20.682	17161
	Difference (*C-D*)	0.151	9.510	17161